WETLANDS MAPPING IN GEORGIA USING LANDSAT IMAGERY

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INTRODUCTION

The Comprehensive Planning Act of 1989 provided for the development of a landcover database to be used in planning at state, regional, and local levels. The Georgia Department of Natural Resources (DNR) is currently developing this database by analyzing satellite imagery. This analysis involves the grouping of all spectral information into a desired number of landcover classes.

Remote sensing the environment is becoming increasingly useful in natural resource management (Robinson and Nagel, 1990). The resultant landcover information can be useful to water resource management in a number of ways.

Landcover maps showing the location and extent of wetlands will assist planners at all levels in guiding development in ways that will minimize adverse impacts to these valuable natural resources. Watershed and stream protection efforts can benefit from up-to-date landcover information that quantifies the location and areal extent of various landcover classes within the target watershed and surrounding areas. The potential exists for modeling patterns of water use based on hydrologic data and landcover information.

DATA SOURCES

Landsat Thematic Mapper (TM) (EOSAT Corp., Lanham, MD) imagery in 5 spectral bands and at 100 ft. x 100 ft. resolution constitutes the primary data source for the landcover classification project. Ancillary data include National High Altitude Photography coverage of major river corridors, other aerial photography from a variety of sources, National Wetland Inventory maps, and other maps.

LANDCOVER CLASSIFICATION

Through an ongoing contract with ERDAS Inc., an image processing firm, the DNR has obtained and is classifying Landsat TM scenes (1988-1990) covering the entire state. To increase the accuracy of determining land cover classes, the imagery is divided into coverages for each of eight physiographic regions in the state. Differences in vegetation phenology, terrain, and predominant vegetation types between regions are accounted for in part by classifying imagery for each region independently.

Fifteen landcover classes, including six wetland classes, are extracted from the imagery in a process that uses field data and photography to train the computer to recognize spectral signatures of landcover classes. Distinctions are made between forested, shrub/scrub, and emergent freshwater wetlands, coastal wetlands, coniferous, mixed, and hardwood forests, cultivated and pasture lands, and low and high density urban areas. Other classes contain areas of open water and clearcut/young pine plantations.

Accuracy of the method was assessed by comparing the computed landcover classifications to field observations at randomly selected sites in each region. Approximately 50 sites are described from the air for each region. The descriptions are compared to the land classes extracted from the imagery for these extracted from the imagery for these areas. The classification without refinement is complete when 85% of the sample areas are classified correctly. The wealth of spectral information in Landsat imagery allows for further refinement of landcover classification, both in accuracy and in number of classes.

MAP PRODUCTION AND DISTRIBUTION

Products from the statewide landcover mapping effort include digital files (raster and vector) for downloading to GIS workstations and paper maps. The 1:24,000 scale maps show each 100 ft. cell color-coded to one of 15 landcover classes, and are referenced to the 1,016 USGS 7.5 minute topographic quad sheets that cover the state. In addition, digital versions of the raw Landsat TM data will be provided to various users.

Distribution through the 18 Regional Development

Centers will make up-to-date landcover information at fairly high resolution available to regional and local planners and water resource managers. The centralized database maintained by DNR will also be updated with this information. At this time, production of maps for the northern part of the state is complete. Completion of the entire project is expected by late 1991. As refinements to the landcover database are made, and analyses of particular sites are completed, a continuous update of regional and local databases will be effected by DNR staff.

RECOMMENDATIONS

It is recommended that as this information is used in water resource and other natural resource planning and management, feedback from users is solicited and assimilated into the development of the landcover database. Such input from users would serve to correct and refine the landcover classification, and function in guiding future directions in landcover database development.

Resource protection regulations resulting from the Clean Water Act of 1972 require jurisdictional determinations of wetland boundaries. Although a landcover database as described herein cannot be used to make these determinations in regulatory efforts, the dissemination of this information may aid in the implementation of regulations that are important elements of water resource planning efforts.

LITERATURE CITED

Robinson, R.R., and D. Nagel. 1990. Landcover Classification of Remotely Sensed Imagery and Conversion to a Vector-Based GIS for the Suwannee River Water Management District. Proceedings of GIS/LIS '90, pp. 219- 224. Anaheim, CA.